

trunnion barrel 21' adapted to be fitted to a shaft for torque transmission and trunnion journals 22' radially projecting from three circumferentially equispaced positions on the trunnion barrel 21', and rollers 30' each rotatable around the trunnion journal 22' through a plurality of needle rollers 32' and received in the track grooves 12' of the outer joint member 10', the roller 30' being guided in the outer peripheral surface by the roller guide surfaces 14'.

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(condil)

Please amend the second full paragraph on page 2 as follows:

In the case of angular contact, when a contact ellipse is produced at two points in the direction of the contact angle and a predetermined torque T is applied, it is necessary that the contact ellipse be in the width of the roller 30'. For this reason, in the existing circumstance, the proportion of the width of the roller 30' to the outer diameter ranges from 32% to 36%. Further, even if the contact angle and contact ratio are reconsidered, the total widthwise contact length exceeds the width of the roller 30'. The phenomenon of both ends of the roller 30' cutting into the roller guide surfaces 14' or the phenomenon of two contact ellipses overlapping each other in the middle of the roller 30', which has been an obstacle to improvement of life and to the reduction of vibration, cannot be avoided.

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Please amend the paragraph bridging pages 2 and 3 as follows:

In the case of conventional circular contact, since the contact ratio ranges from 1.002 to 1.008 when a predetermined torque T is applied, the widthwise contact ellipse length some times exceeds the width of the roller 30'. For this reason, there is a limit to the reduction of the width of the roller 30' as in the case of angular contact. In the existing circumstances, the proportion of the width of the roller 30' to the outer diameter ranges from 32% to 36%. Further, if the width of the roller 30' is reduced, the total widthwise contact length

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far exceeds the width of the roller 30', obstructing the improvement of life and the reduction of vibration.

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(continued)

Please amend the first full paragraph on page 3 as follows:

Further, in both angular contact and circular contact, the roller guide surfaces 14' have a radius of curvature R at a certain contact ratio and the major and minor inner diameters are, as such, connected. When the tripod joint is rotating while taking an operating angle, an angular displacement also occurs between the roller 30' and the roller guide surfaces 14'. This causes wearing of the roller guide surfaces to proceed. Then, there occurs on both the major and minor diameter sides the phenomenon of both ends of the roller 30' cutting into the roller guide surfaces 14', forming a cause of increasing the vibration.

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Please amend the second full paragraph on page 4 as follows:

It has been found that the noise, vibration, hardness (hereinafter "NVH") characteristic of tripod joints depends on the angle at which needle rollers can actually skew. The skew angle is determined by the radial clearance and circumferential clearance but this has not heretofore been taken into consideration. Therefore, the NVH characteristic differs according to differences in the proportions or size of a tripod joint and optimization of this situation has not been made at present.

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Please amend the paragraph bridging pages 7 and 8 as follows:

According to an embodiment of the invention, a tripod type constant velocity universal joint comprises an outer joint member having three axial track grooves in the inner periphery and roller guide surfaces formed in the opposed side walls of each track groove, a tripod member having three radially projecting trunnion journals, and rollers rotatable around the respective trunnion journals

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through a plurality of needle rollers and received in the track grooves of the outer joint member, each roller being guided in the outer peripheral surface by the roller guide surfaces, wherein contact between the roller and the roller guide surfaces is circular contact whose contact ratio is 1.01 or above and the width dimension of the roller is reduced to the extent that the contact ellipse produced in the roller during the application of a predetermined torque does not deviate from the end surface of the roller. In other words, as will become clear from the following discussion, the contact ratio defines the ratio of the radius of curvature R of the roller guide surface relative to the radius of curvature r of the roller outer peripheral surface. By ensuring that the form of contact between the roller and the roller guide surfaces is circular contact and setting the contact ratio such that the widthwise contact ellipse length under a predetermined torque load is not more than the widthwise length of the roller, it is made possible to achieve weight reduction, compactification and good durability.

A7 (concluded)

Please amend the first full paragraph on page 8 as follows:

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The contact ratio of the roller to the roller guide surface may be so set that the surface contact pressure produced by the roller during the application of a predetermined torque is not more than the contact surface pressure produced between the trunnion journal and the needle rollers. In particular, the contact ratio of the roller to the roller guide surface may range from 1.02 to 1.2.

Please amend the paragraph bridging pages 8 and 9 as follows:

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The portion of the roller guide surface corresponding to the end of the roller may be formed with a relief portion. The provision of such relief portion prevents the roller from cutting into the roller guide surfaces and makes it possible to obtain good vibration characteristics. Since the corner portion (which is a cold forged surface, thus having no edge) which connects the radius

of curvature, R, of the roller guide surfaces to the relief portion makes contact within the range of the roller outer diameter surface, no cutting-in occurs. Preferably, the relief portion may be in the form of an arc smoothly connected to the roller guide surface.

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Please amend the first full paragraph on page 10 as follows:

These skew angles θ_1 and θ_2 are obtained and the smaller one is the skew angle that can actually occur.

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Please amend the fourth full paragraph on page 17 as follows:

The roots of the trunnion barrel and the trunnion journal may be of two-step shape, and the corner at the trunnion journal may be one surface, or a round surface, continuously extending with a predetermined radius of curvature.

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Please amend the fifth full paragraph on page 18 as follows:

Fig. 4A shows a cross sectional view of a conventional tripod joint;

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Please insert the following paragraph between the fifth and sixth full paragraphs on page 17 as follows:

Fig. 4B shows a cross sectional view of the tripod joint according to an embodiment of the present invention;

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Please amend the first full paragraph on page 24 as follows:

As has been described, in the first embodiment of the invention, the form of contact between the roller and the roller guide surfaces is circular contact and the contact ratio is set so that the widthwise contact ellipse length is not more than the widthwise length of the roller during the application of a predetermined torque, whereby weight reduction, compactification and good durability of the tripod joint can be achieved. Fig. 4B illustrates this. In Fig. 4A, a conventional tripod joint is shown in the left half and the tripod joint embodying the invention is shown in the right half for comparison.

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Please amend the paragraph bridging pages 24 and 25 as follows:

The first and second embodiments are the same as far as the basic construction of tripod joint is concerned and as previously described in connection with Figs. 2A, 2B, 3A, 3B, and 3C. Here, the outer peripheral surface of the roller 30 may be a partial spherical surface with its center of curvature located on the axis; besides this, it may be a convexly curved surface using an arc as its generating line with its center of curvature located at a position radially spaced from the axis. The form of contact of the roller 30 with the roller guide surfaces 14 may be angular contact as shown in Fig. 5A or circular contact as shown in Fig. 5B, wherein reference character r identifies the radius of curvature of the outer peripheral surface of the roller 30. Angular contact has a certain contact angle and occurs at two points, so that contact ellipses occur at two points in the direction of contact angle. Circular contact occurs between spherical surfaces and at one point. In either case, it is necessary to set the width L_s of the roller 30 so that the contact ellipse does not deviate from the end surface of the roller 30 but comes within the roller width when a predetermined torque is applied. If the contact ratio is small, the contact ellipse becomes larger during torque application, exceeding the width L_s of the roller 30, leading to short life. Reversely, if the contact ratio is large, the contact ellipse becomes smaller, but the surface pressure increases, accelerating the wearing of the contact portions, leading to short life. Structurally, however, the surface pressure in the tripod joint is severest in the region between the trunnion journal 22 and the needle rollers 32; therefore, it is recommended to set the contact ratio so that the surface pressure in this region does not exceed the limit. Concretely, the contact ratio should be in the range of 1.02 – 1.2 or more preferably in the range of 1.05 – 1.18. Further, the ratio